

# Victor (JVC) HV-MD2 / Mitsubishi MD-CZ11

## MUSE Decoder and Downconverter

### User's Guide

The HV-MD2 (or MD-CZ11, the same unit under another nameplate) is a decoder for the bandwidth-compressed analog High Definition Television transmission format developed for direct-to-home satellite broadcasting by NHK, the Japanese State broadcaster, which also provides a 525-line downconversion of the HDTV signal, for compatibility with conventional TVs and VCRs. Although a planned wider scope of application did not in fact come about, regular daily MUSE HDTV broadcasts on BS channel 9 began in 1991 and continued until 2007, and the same encoding was used for consumer high-definition videodiscs, under the name *Hi-Vision LD*. A dedicated input is provided on the HV-MD2 for playing back these discs.

MUSE stands for multiple sub-Nyquist sampling encoding, a description of the bandwidth-compression technique employed. In essence, picture elements are deleted in a manner which alternates frame-by-frame and line-by-line, and the result is low-pass filtered. By highly precise sampling of this narrow-band signal, the image can be reconstructed using interpolation and memory circuits. Such a process was first proposed in the early 1950s, but it only became technically feasible with the advance of microelectronics in the 1980s. Separate processing branches are used for moving and stationary image areas, producing an output which is effectively a blend of 1125-line, 15 frame per second, and 562.5-line, 60 fps progressively-scanned pictures. To improve performance during motion of the whole frame, motion vectors are transmitted. Quasi-constant-luminance encoding is used for colour, with differential components transmitted by line-sequential time-division multiplexing. Companded differential PCM digital audio is transmitted by baseband multiplex during the vertical blanking interval.

**Notes** Descriptions of the functions of the HV-MD2 are largely adapted from the Japanese-language owner's manual, with contributions from other documentation and user input. Information on the MUSE system is taken from various sources, including *Recommendation ITU-R BO.786*, "MUSE system for HDTV broadcasting-satellite services", and numbers of *NHK Laboratories Note*.

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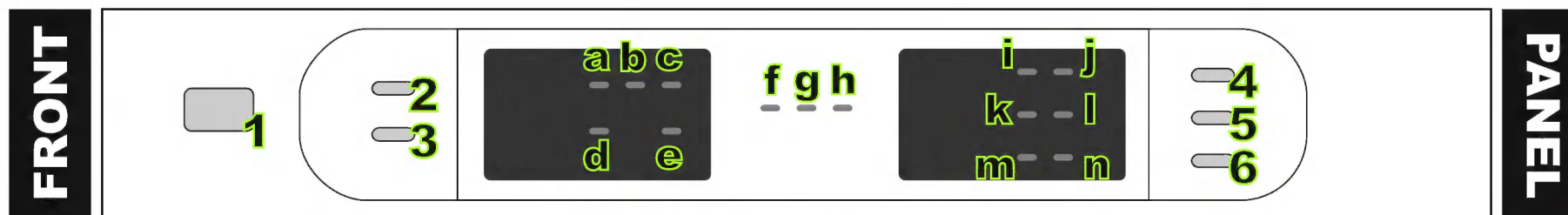
#### Summary

Video		
Lines per Frame	1125 (1032 active)	525
Field Rate / Interlace	60.00 Hz / 2:1	
Output Format	Y <sub>P</sub> P <sub>R</sub>	Composite, Y/C separate
Synchronizing Signal	Trilevel, on all components	Bilevel on composite/Y Burst on C
Bandwidth (stationary image areas)	20 MHz Y 7 MHz P <sub>B</sub> , P <sub>R</sub>	
Output Connectors (two places)	RCA × 3 (1 V p-p, 75Ω)	RCA (1 V p-p, 75Ω) Mini-DIN (1 V p-p Y, 0.286 V p-p C, 75Ω)

Audio		
DANCE Mode	A	B
Channels	4	2
Sampling	32 kHz 15 bits	48 kHz 16 bits
Transmitted Data	8 bits × 8 ranges	11 bits × 6 ranges
Outputs	RCA × 4 (LCRS/L'R') RCA × 2 (LR/L'R')	

Input Connectors	MUSE	RCA (0.8 V p-p 75 Ω)
	Detector, two places	RCA (0.8 V p-p 75 Ω)

Dimensions	435 × 76 × 365 mm (W×H×D), 4.9 kg Including feet	
Power consumption	AC 100 V, 50/60 Hz, 21 W (2.1 W in standby mode)	
Power outlet	Pass-through, unswitched, 300 W max	



① Power button

② Input Select button — When lamp (a) illuminates, the inputs in rear-panel (E) are selected ; lamp (b) corresponds to (D), and lamp (c) to the MUSE LD input (A).

③ NTSC Output Select button — When lamp (d) illuminates, if rear-panel (D) or input is selected with button (2), and a MUSE signal is present, a 525-line downconversion of the MUSE signal being decoded is present at both NTSC outputs. If some other signal is present at the selected input, it is routed to the descrambler output (C), and the input from (C) is routed to the NTSC outputs in (D) and (E). When lamp (e) illuminates, if the signal at the selected input is a MUSE signal and the signal at the other input is not, the signal at the non-selected input is routed to (C) and the (C) input signal is returned to the output corresponding to the non-selected input. This was to allow, for example, recording a Hi-Vision broadcast while watching a pay-TV broadcast.

(f) Illuminates when a MUSE signal is being decoded.

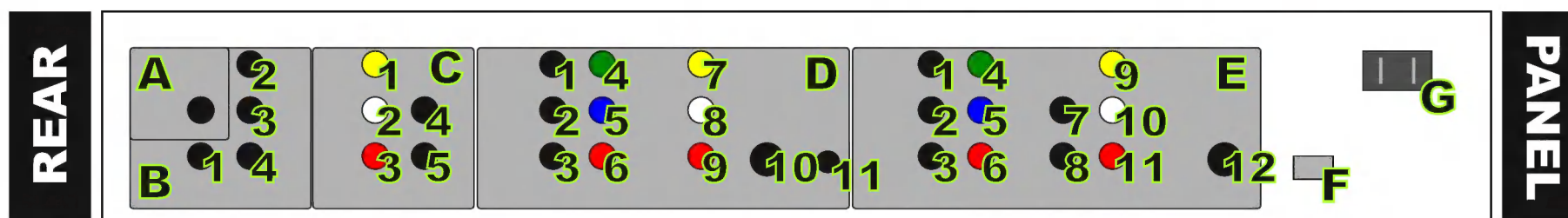
(g) Illuminates when the MUSE signal includes an independent audio program.

(h) Illuminates when the MUSE signal includes a secondary audio program.

④ Audio select — Not functional unless lamp (g) is illuminated. When lamp (i) illuminates, TV audio is selected ; lamp (j) indicates that the independent audio program is selected.

⑤ Audio select — Not functional unless lamp (h) is illuminated. When lamp (k) illuminates, main audio is selected ; lamp (l) indicates that the secondary audio program is selected. If both programs are selected, both lamps will illuminate.

⑥ Downconverter control — When lamp (m) illuminates, the 525-line downconversion is a 4:3 aspect ratio center cut from the 16:9 picture ; when lamp (n) illuminates, the full frame is output, to fit a widescreen NTSC display. No provision is made for a letterboxed downconversion.



(A) This input is designated specifically for the output from a Hi-Vision LD Player, making it the only input relevant to most users.

(B) This block allows connecting a descrambler for MUSE pay-TV broadcasts (which were not implemented), and is not relevant to most users.

(C) This block allows connecting a descrambler for satellite NTSC pay-TV broadcasts, and is not relevant to most users.

(D) This block is intended for connecting a VCR. In addition to stereo audio, and composite and Y/C separate NTSC video, HD component video outputs are provided, for use with the JVC W-VHS analog HD VCR. The necessary

connectors are also provided for a BS tuner, included in some Japanese VCRs. An AV *Compulink II* connector allows controlling the decoder from certain models of JVC VCR, for time-recording purposes.

(E) Connectors in this block are intended for a HDTV or standard television, and optionally a BS tuner (included in some Japanese TVs) and a stereo or multi-channel audio system.

(F) System control switch (see diagram on next page).

(G) Unswitched power outlet. Not to be used with a television, but suitable for a VCR or LD player.



## Rear Panel Labels

- A MUSE (Hi-Vision) LD 入力 Hi-Vision LD input**  
MUSE 入力 MUSE input
- B MUSE 拡張 MUSE expansion**
- 1 MUSE ビットストリーム出力 MUSE bitstream output
  - 2 検波出力 detector output
  - 3 MUSE 出力 MUSE output
  - 4 AFC入力 AFC input
- C BSデコーダー BS Descrambler**
- 1 映像入力 video input
  - 2-3 音声入力 audio input
  - 2 左 left
  - 3 右 right
  - 4 ビットストリーム出力 bitstream output
  - 5 検波出力 detector output
- D W-VHS (VHS)**
- 1 AFC入力 AFC output
  - 2 ビットストリーム入力 bitstream input
  - 3 検波入力 detector input
  - 4 Y
  - 5  $P_B$
  - 6  $P_R$
  - 7 映像出力 video output
  - 8-9 音声出力 audio output
  - 8 左 left
  - 9 右 right
  - 10 (M-N専用) S1出力 S-Video output (downconversion only)
  - 11 AV コンピュータリンク II AV Compulink II
- E テレビ TV**
- 1 AFC入力 AFC output
  - 2 ビットストリーム入力 bitstream input
  - 3 検波入力 detector input

- 4 Y
- 5  $P_B$
- 6  $P_R$
- 7-8, 10-11 音声出力 audio output
- 7 センター center
- 8 サラウンド surround
- 9 映像出力 video output
- 10 左 left
- 11 右 right
- 12 (M-N専用) S1出力 S-Video output (downconversion only)

## Notes

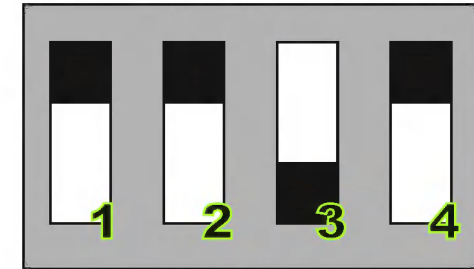
Ⓓ⓫ and Ⓔ⓬ are mini-DIN S-Video connectors. Ⓓ⓫ is a 1/8" mini phone jack. Ⓕ is a group of four sliding switches. Ⓖ is a Japanese-standard two-prong electrical receptacle. All other items are RCA connectors, with insulators in approximately the colors illustrated. All connectors are female.

When the *Full* (16:9) downconversion mode is selected, +5 V DC is impressed on the C line of the S-video outputs Ⓓ⓫ and Ⓔ⓬.

The line frequency of the downconverted video is locked to the Hi-Vision frame rate, which differs by one part in 1001 from the standard value for (color) NTSC. As the chroma subcarrier frequency (3 579 545 Hz) remains unchanged, the normal coherent SC-H phase relationship does not exist, and comb filtering cannot be performed satisfactorily. For this reason, the S-video outputs Ⓓ⓫ and Ⓔ⓬ should be used if a standard-definition output is required.

While some users outside Japan prefer to employ a stepdown transformer to provide power at the Japanese standard 100 V AC, the HV-MD2 should operate satisfactorily on 110—120 V American house current.

## System Control Switch



① In the UP position, the decoder goes into standby mode and awaits operation of the front-panel power button when power is first applied. In the DOWN position, the unit switches on when power is applied. This allows for connecting the unit to a switched outlet.

② In the UP position, 4-channel audio is output when A-Mode 3-1 stereo audio is decoded, using rear-panel Ⓔ⓫⓬ for right and left, and Ⓔ⓪⓸ for center and surround channels. In the DOWN position, the center and surround channels are mixed into the left and right, and only Ⓔ⓫⓬ are active. This downmixed audio is output at all times from Ⓓ⓪⓹.

③ Should be in the UP position only when the decoder is connected to a JVC model AV32-EM6 HDTV. Most users will leave it in the DOWN position at all times.

④ Must be left in the UP position at all times for proper function of the decoder.